Success Stories in Software Reuse & UI Development

Trey Roby
IPAC, Caltech

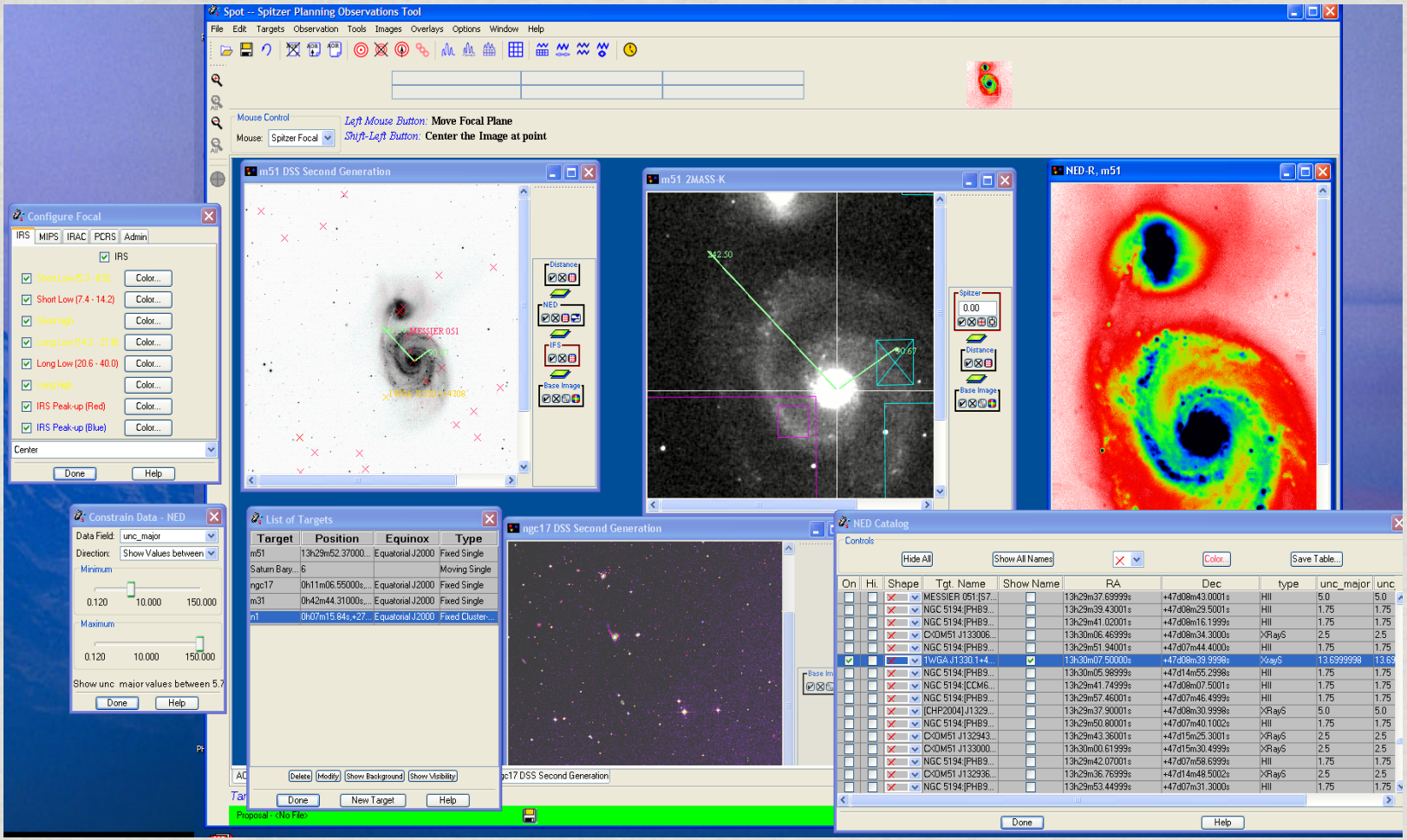
Goals

- Starting Reuse early
- Effective UI development
- Rant

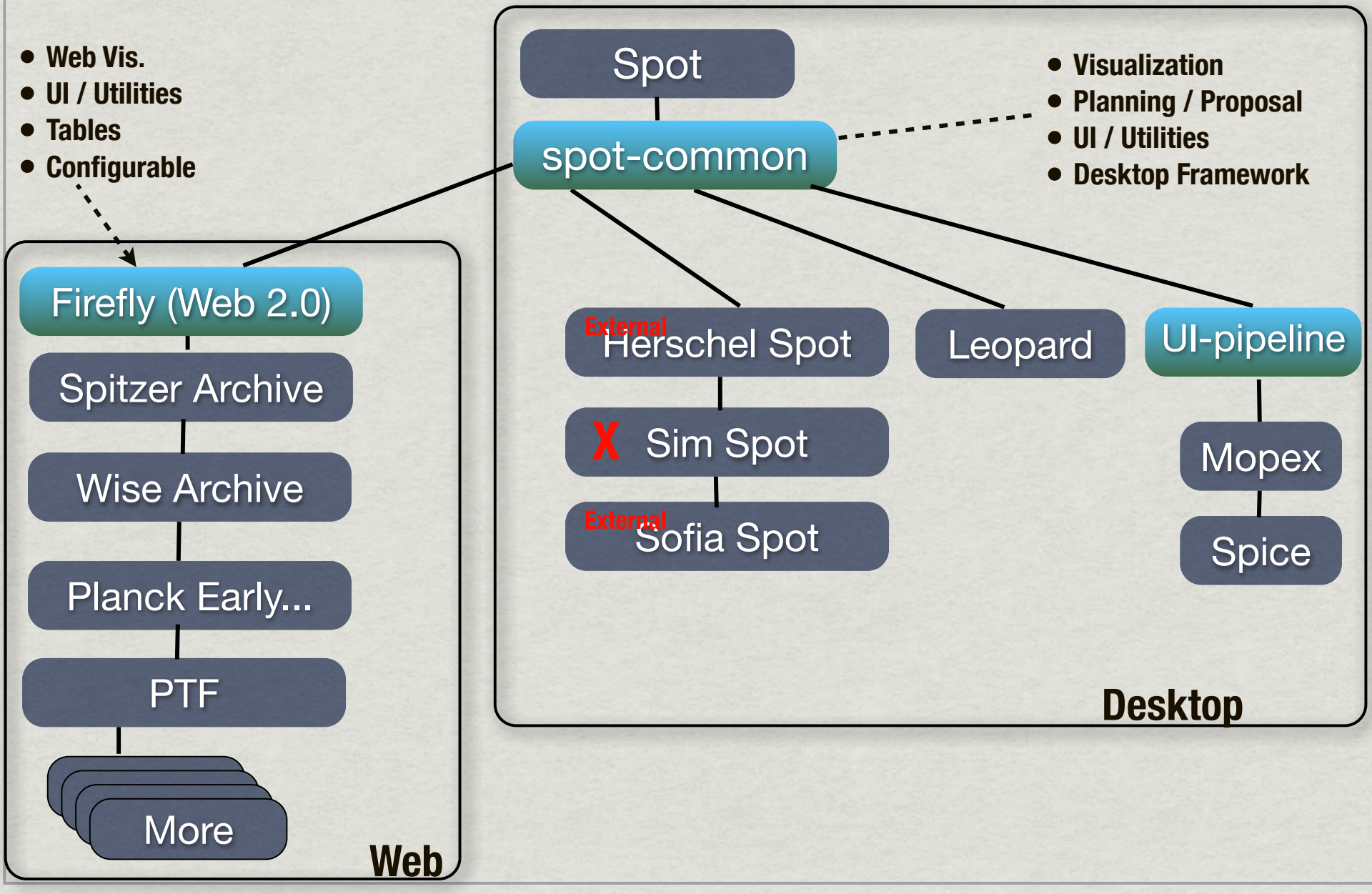
Spot Development

- Started 1999
- Java Desktop Application
- Spitzer planning tools
- No re-use planed

Spot


Spot -- Spitzer Planning Observations Tool
File Edit Targets Observation Tools Images Overlays Options Window Help
Mouse Control
Mouse: Spitzer Focal
Left Mouse Button: Move Focal Plane
Shift-Left Button: Center the Image at point
m51 DSS Second Generation
m51 2MASS-K
NED-R, m51
Configure Focal
IRS MIPS IRAC PCRS Admin
IRS
Short Low (5.3 - 8.5)
Short Low (7.4 - 14.2)
Short high
Long Low (14.2 - 21.8)
Long Low (20.6 - 40.0)
Long high
IRS Peak-up (Red)
IRS Peak-up (Blue)
Color...
Center
Done
Help
Constrain Data - NED
Data Field: unc_major
Direction: Show Values between
Minimum
0.120 10.000 150.000
Maximum
0.120 10.000 150.000
Show unc major values between 5.7
Done
Help
List of Targets
Target Position Equinox Type
m51 13h29m52.37000... Equatorial J2000 Fixed Single
Saturn Bary... 6 Moving Single
ngc17 0h11m06.55000s... Equatorial J2000 Fixed Single
m31 0h42m44.31000s... Equatorial J2000 Fixed Single
n1 0h07m15.84s,+27... Equatorial J2000 Fixed Cluster-...
Delete Modify Show Background Show Visibility
Done New Target Help
ngc17 DSS Second Generation
Proposal - <No File>
NED Catalog
Controls
Hide All
Show All Names
Color...
Save Table...
On Hi. Shape Tgt. Name Show Name RA Dec type unc_major unc
Done
Help

Reuse History



Challenges

Firefly (Web 2.0)

- Advanced tables for very large queries ← Hard
- Visualize FITS on the Web ← Never been done
- Interactive UI ←
- Easy data selection and download ← Ease of Use
- Configurable for multiple archives ← Reuse $$$ Saver

What is Firefly?

Firefly (Web 2.0)

- Web based / AJAX / GWT
- Framework for archive UI
- Highly integrated
- Web FITS visualization
- Spectrum visualization
- “Excel-like” table features
- Scalable
- User-friendly
- Configurable

UI Features

Firefly (Web 2.0)

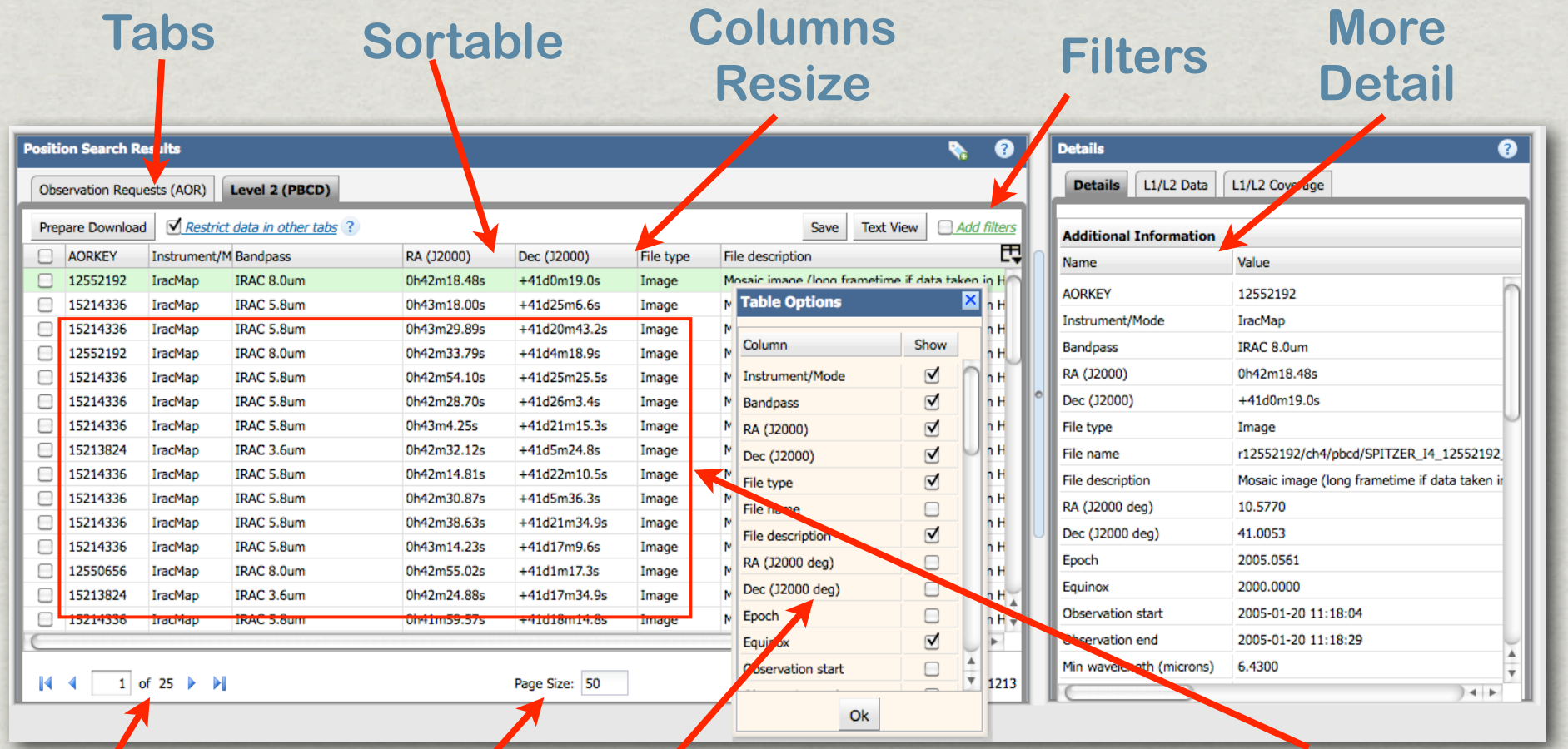
- Complexity hidden
- Field validation
- Iterative target lookups
- Backgrounding jobs
- Search histories
- Help, Tool tips
- Preferences
- Data packaging

Advantages

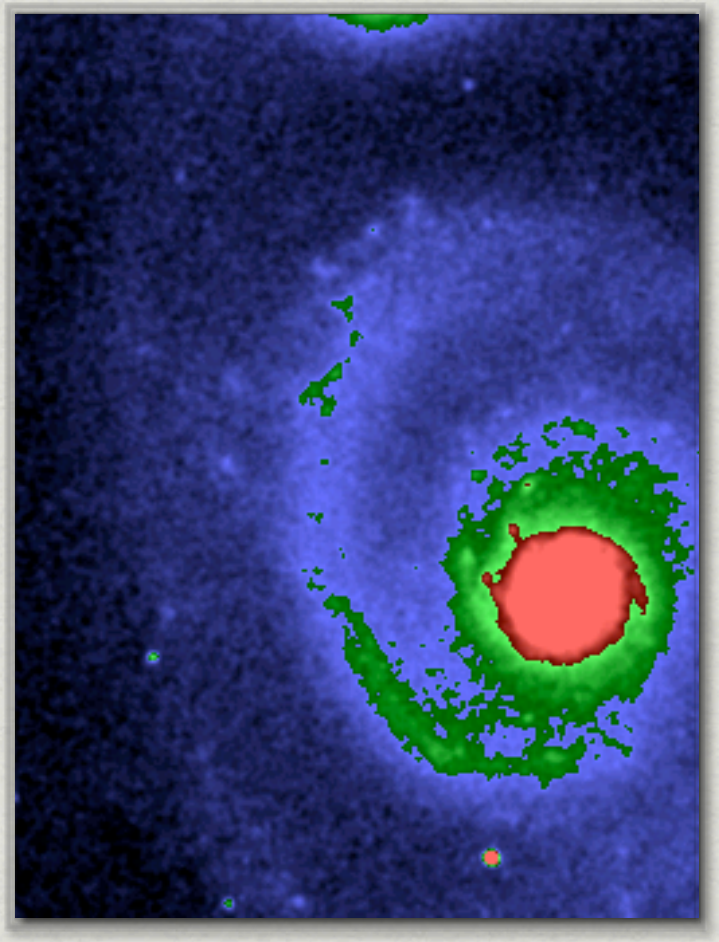
Firefly (Web 2.0)

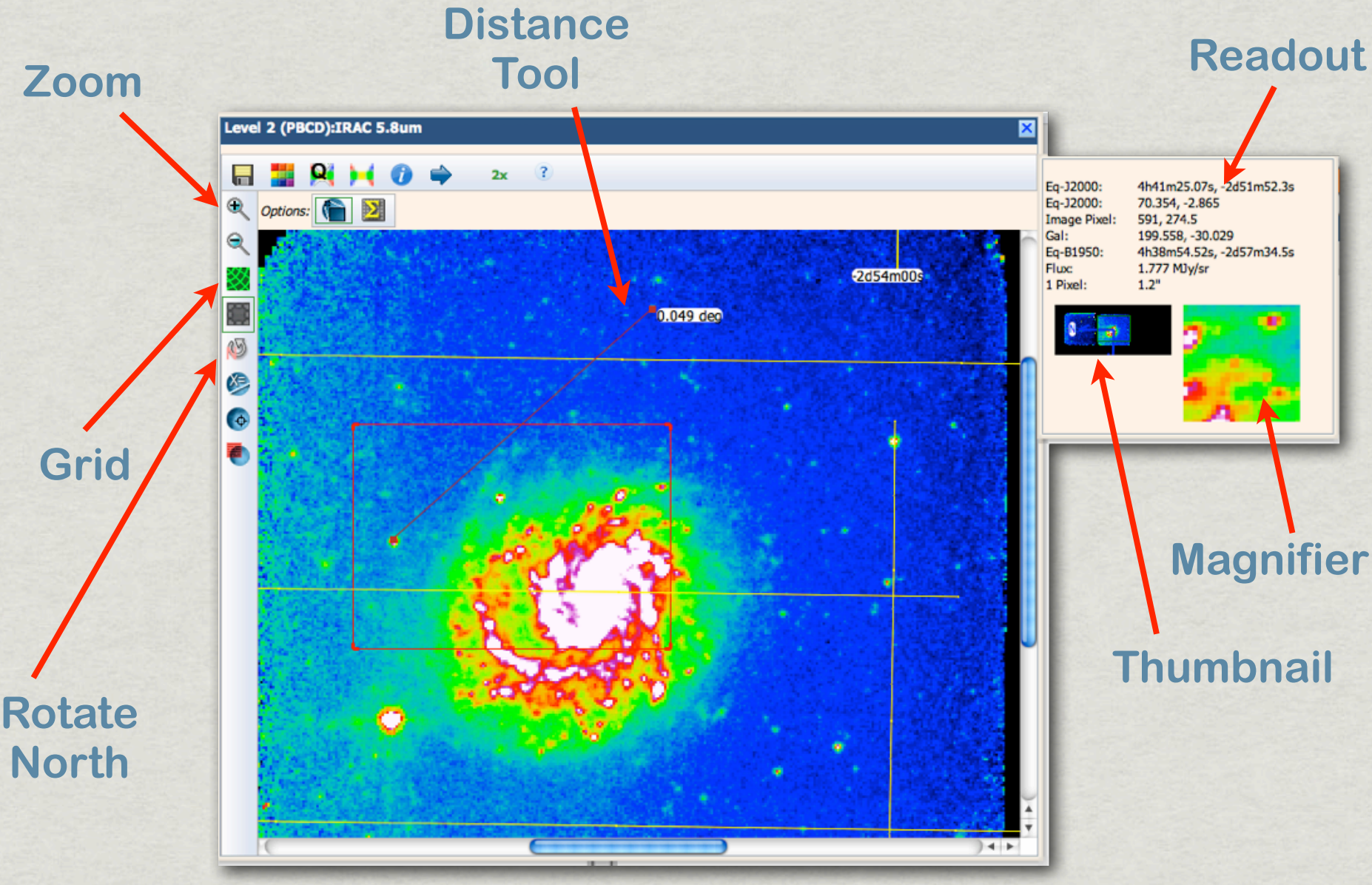
- Consistent Look & Feel
- Time Saver
- Cost Saver
- Less learning curve
- Focus on one development
- Synergy across projects

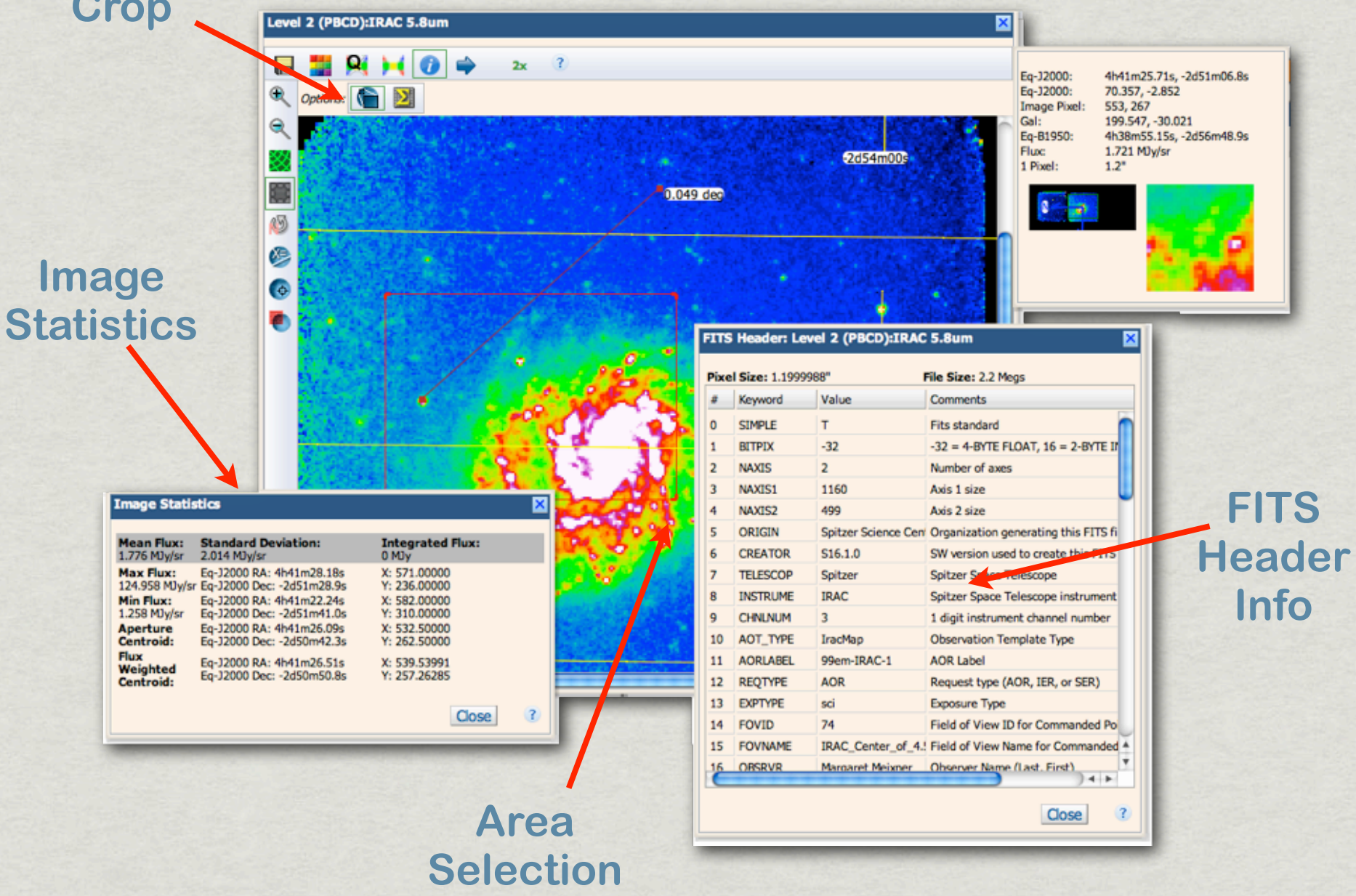
Paging Scroll Table

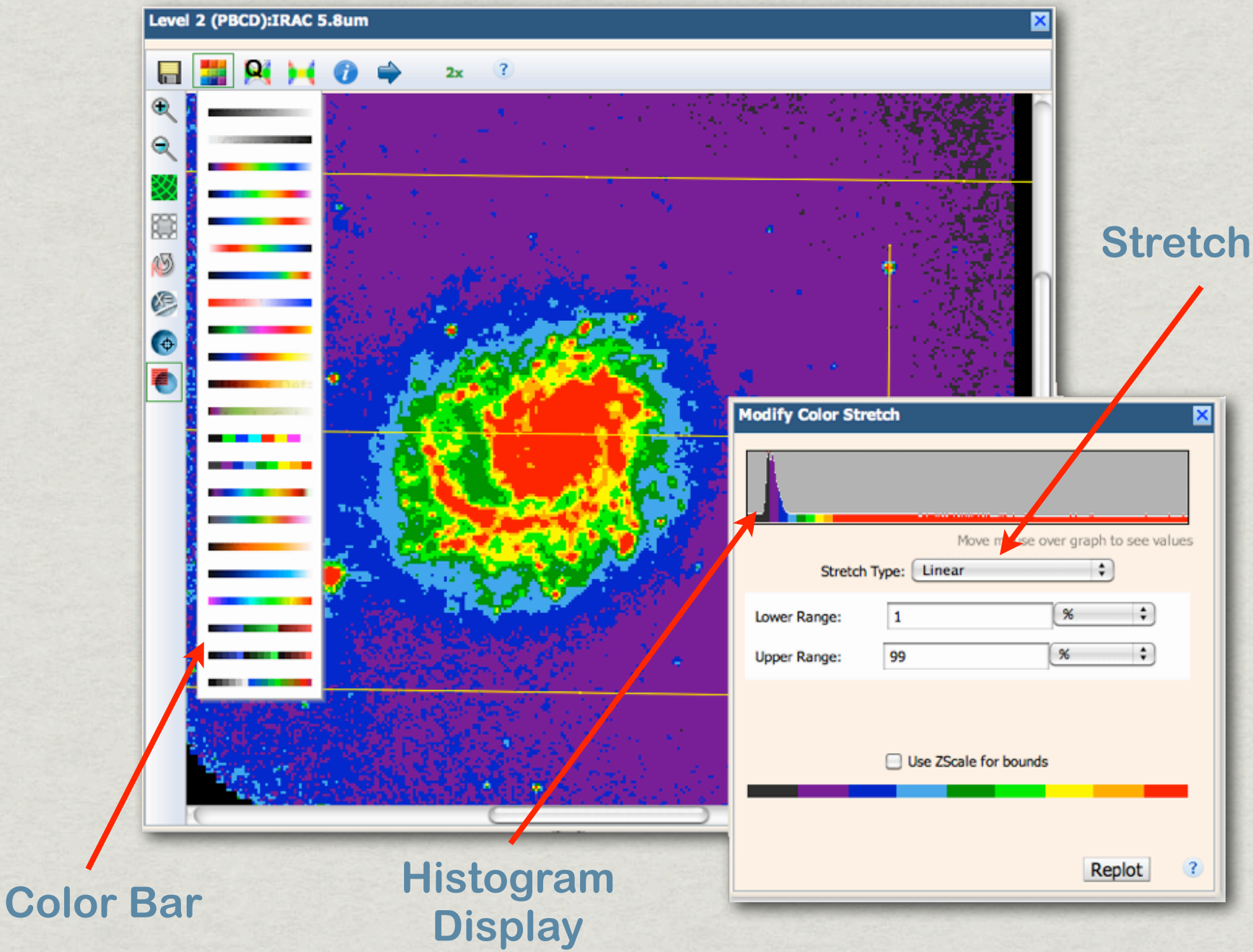


Visualization




Zoom
Distance Tool
Readout
Grid
Rotate North
Magnifier
Thumbnail
Level 2 (PBCD):IRAC 5.8um
Options:
2x
0.049 deg
-2d54m00s
Eq-J2000: 4h41m25.07s, -2d51m52.3s
Eq-J2000: 70.354, -2.865
Image Pixel: 591, 274.5
Gal: 199.558, -30.029
Eq-B1950: 4h38m54.52s, -2d57m34.5s
Flux: 1.777 MJy/sr
1 Pixel: 1.2"


Crop
Image Statistics
Area Selection
FITS Header Info
Level 2 (PBCD):IRAC 5.8um
Options:
2x
-2d54m00s
0.049 deg
Eq-J2000: 4h41m25.71s, -2d51m06.8s
Eq-J2000: 70.357, -2.852
Image Pixel: 553, 267
Gal: 199.547, -30.021
Eq-B1950: 4h38m55.15s, -2d56m48.9s
Fluxc 1.721 MJy/sr
1 Pixel: 1.2"
Image Statistics
Mean Flux: 1.776 MJy/sr
Standard Deviation: 2.014 MJy/sr
Integrated Flux: 0 MJy
Max Flux: 124.958 MJy/sr
Eq-J2000 RA: 4h41m28.18s
Eq-J2000 Dec: -2d51m28.9s
X: 571.00000
Y: 236.00000
Min Flux: 1.258 MJy/sr
Eq-J2000 RA: 4h41m22.24s
Eq-J2000 Dec: -2d51m41.0s
X: 582.00000
Y: 310.00000
Aperture Centroid:
Eq-J2000 RA: 4h41m26.09s
Eq-J2000 Dec: -2d50m42.3s
X: 532.50000
Y: 262.50000
Flux Weighted Centroid:
Eq-J2000 RA: 4h41m26.51s
Eq-J2000 Dec: -2d50m50.8s
X: 539.53991
Y: 257.26285
Close
FITS Header: Level 2 (PBCD):IRAC 5.8um
Pixel Size: 1.1999988"
File Size: 2.2 Megs
Keyword Value Comments
0 SIMPLE T Fits standard
1 BITPIX -32 -32 = 4-BYTE FLOAT, 16 = 2-BYTE I
2 NAXIS 2 Number of axes
3 NAXIS1 1160 Axis 1 size
4 NAXIS2 499 Axis 2 size
5 ORIGIN Spitzer Science Cen Organization generating this FITS fi
6 CREATOR S16.1.0 SW version used to create this FITS
7 TELESCOP Spitzer Spitzer Space Telescope
8 INSTRUME IRAC Spitzer Space Telescope instrument
9 CHNLNUM 3 1 digit instrument channel number
10 AOT_TYPE IracMap Observation Template Type
11 AORLABEL 99em-IRAC-1 AOR Label
12 REQTYPE AOR Request type (AOR, IER, or SER)
13 EXPTYPE sci Exposure Type
14 FOVID 74 Field of View ID for Commanded Po
15 FOVNAME IRAC_Center_of_4.! Field of View Name for Commanded
16 OBSRVR Margaret Meixner Observer Name (Last, First)
Close


Level 2 (PBCD):IRAC 5.8um
2x
Modify Color Stretch
Move mouse over graph to see values
Stretch Type:
Linear
Lower Range:
1
%
Upper Range:
99
%
Use ZScale for bounds
Replot
Stretch
Color Bar
Histogram Display

Firefly Reuse Challenge

SOFIA IRAS PLANK

SPITZER 2MASS

DENIS MSX PTF

LEGACY

WISE

BOLOCAM IRTS

HERSCHEL

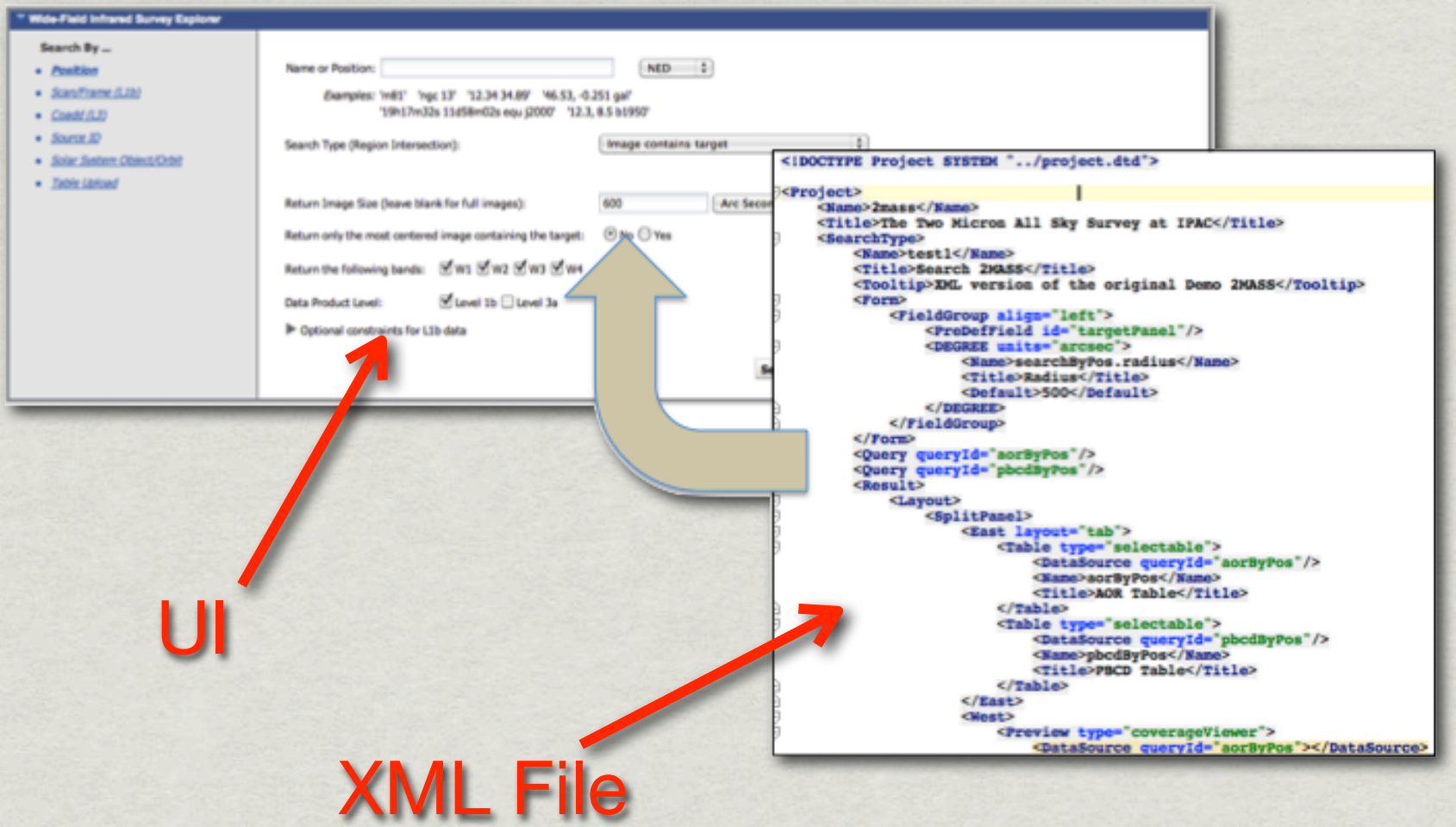
Requirements: Moving Target

It gets worse…..

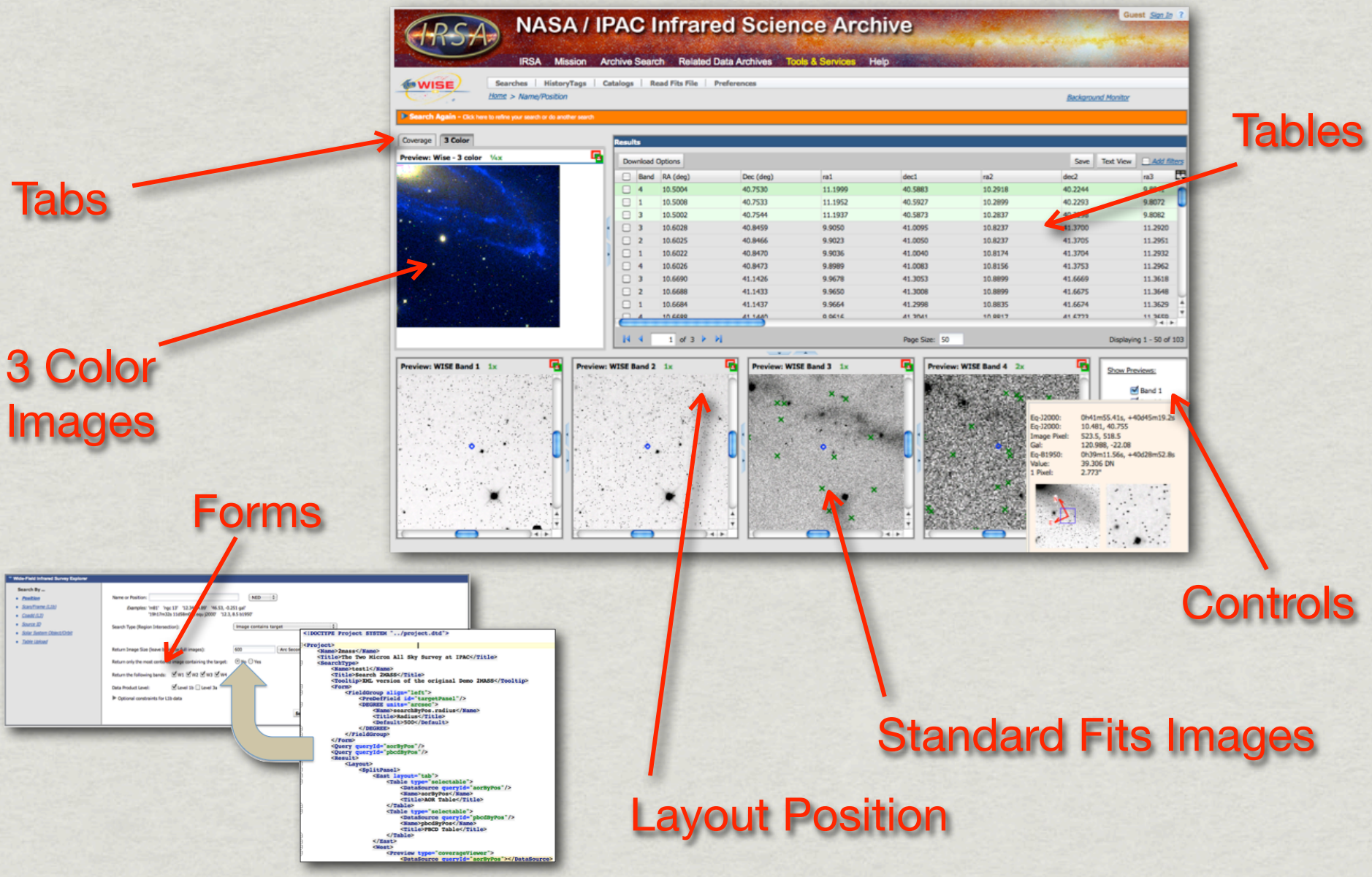
AJAX UI Web Development Is Hard

- Desktop-like UI
- Event oriented
- Asynchronous
- Multi-browser testing required
- Complex layout & interaction

Configurable Interface



Each Component & Behavior Configurable



Flexibility: Huge Benefits

- Separates Data services from UI
- Supports specific needs
- Very little code
- Sharing capabilities
- Consistent UI
- Cost savings
- Fast changes
- Quick development
- End user focus
- Synergy
  - ➡ Testing
  - ➡ Features
  - ➡ Support

UI Conclusions

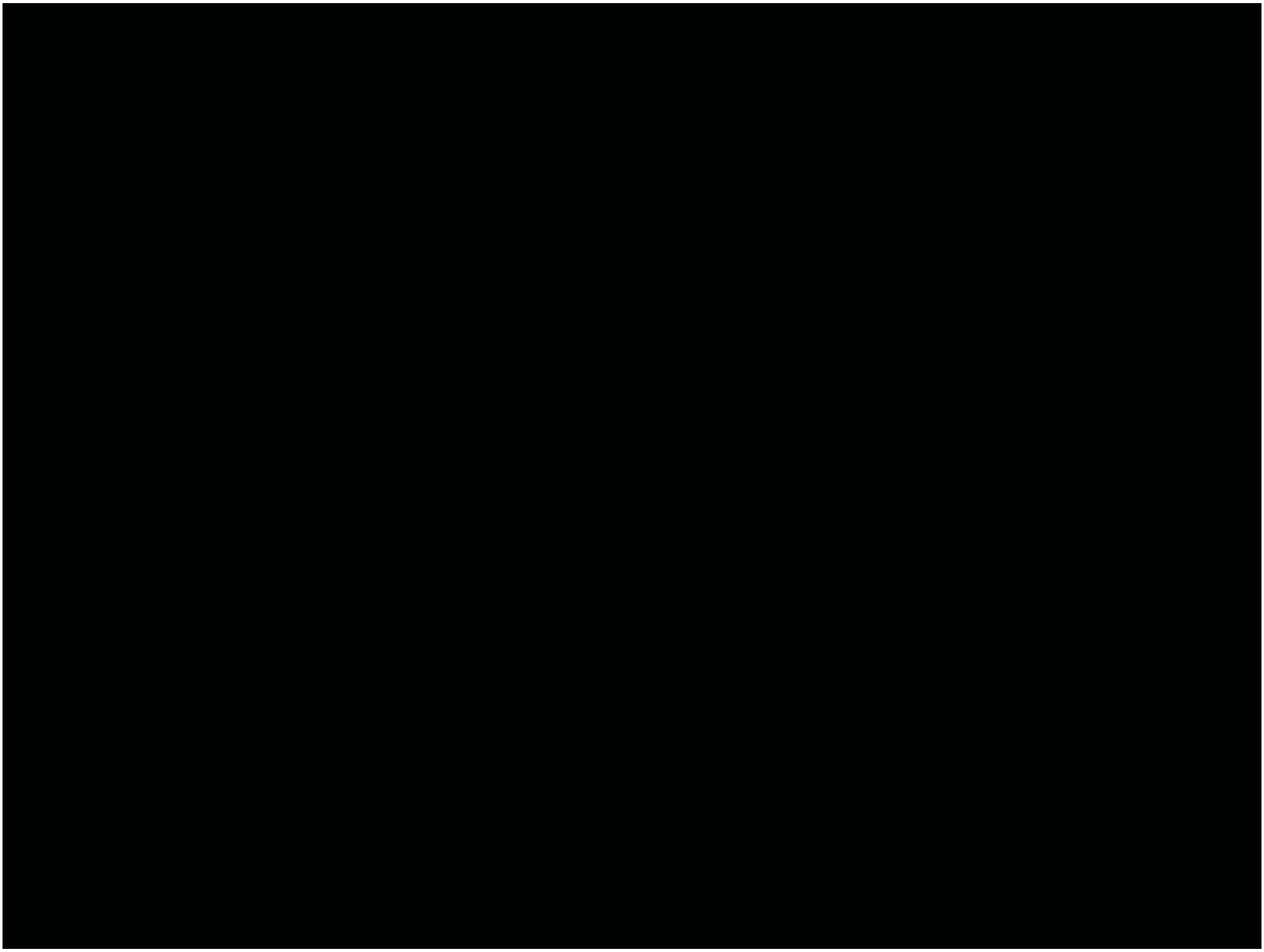
- UI need to be considered important
- Need a senior developer / visionary
  - ➡ Error 1 : hire junior developer and leave him alone
  - ➡ Error 2: Scientist with out strong CS skills
- Lots of skill out there

Reuse - Conclusions

1. Think about reuse from day 1
2. Use simple software engineering
3. Mix CS people & Science developers
4. Train Object Oriented
5. Team development

Rant

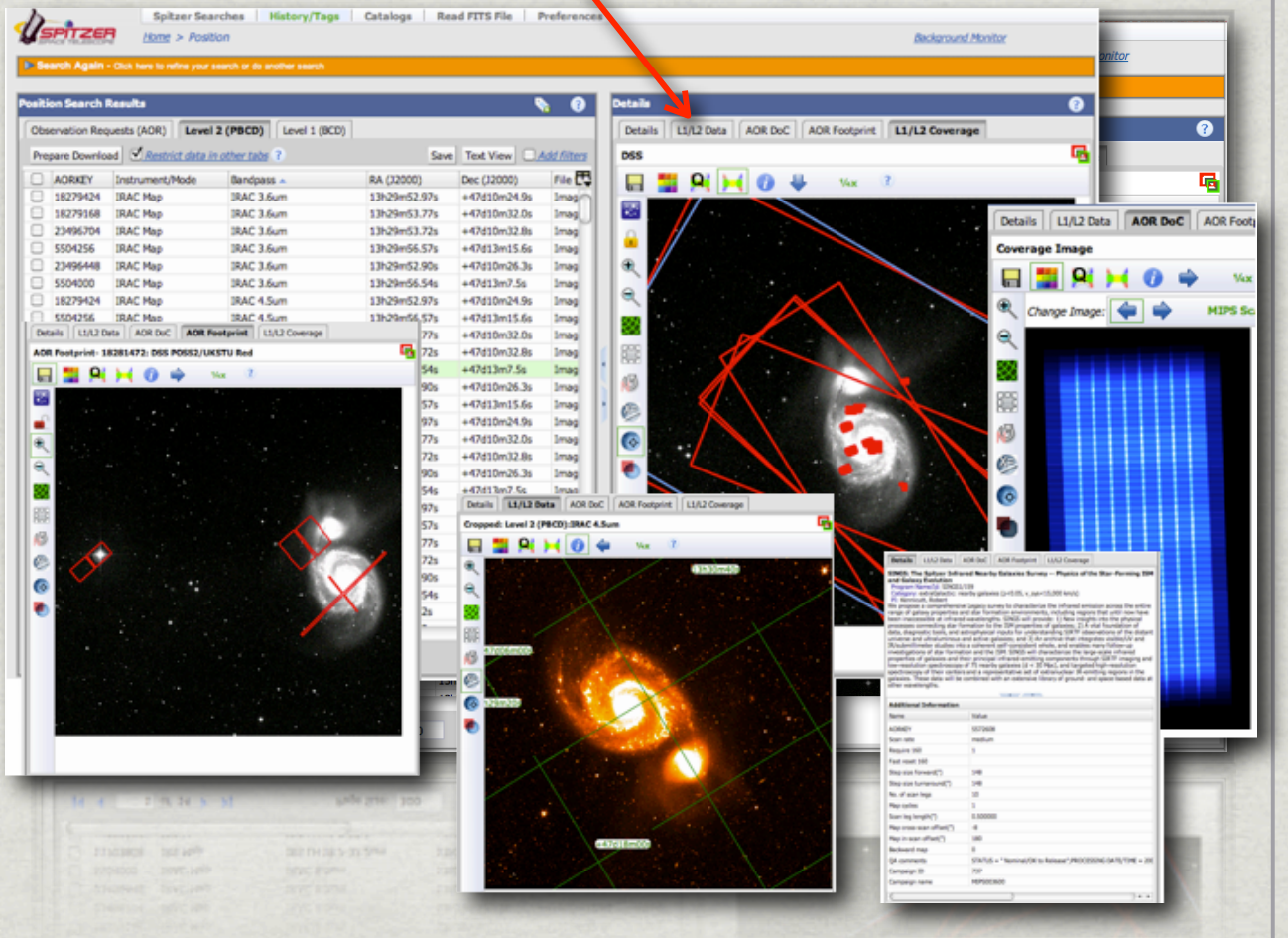
- Many large data set issues are software issues
- Quality software necessary for large data sets
- Quality software should be financed
- Long slow change but must start



Appendix

Use: Spitzer Heritage Archive

Many displays behind tabs



Released:

- V1: Dec 2009
- V1.5: June 2010
- V2: March 2011

1-2 TB / Week

Use: Planck Early Release Catalog

Released:

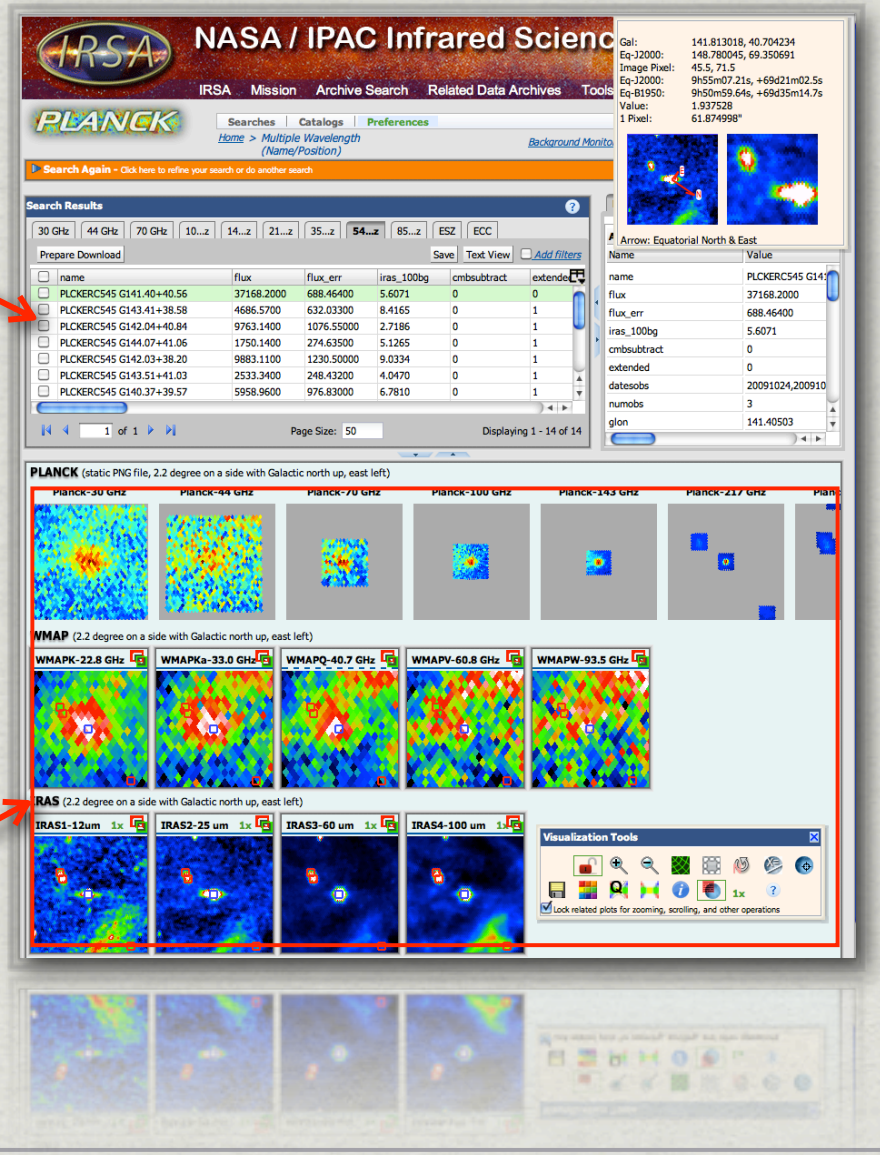
- V1: January 2011

ESA mission with NASA participation

Multi-image analysis

Click Here

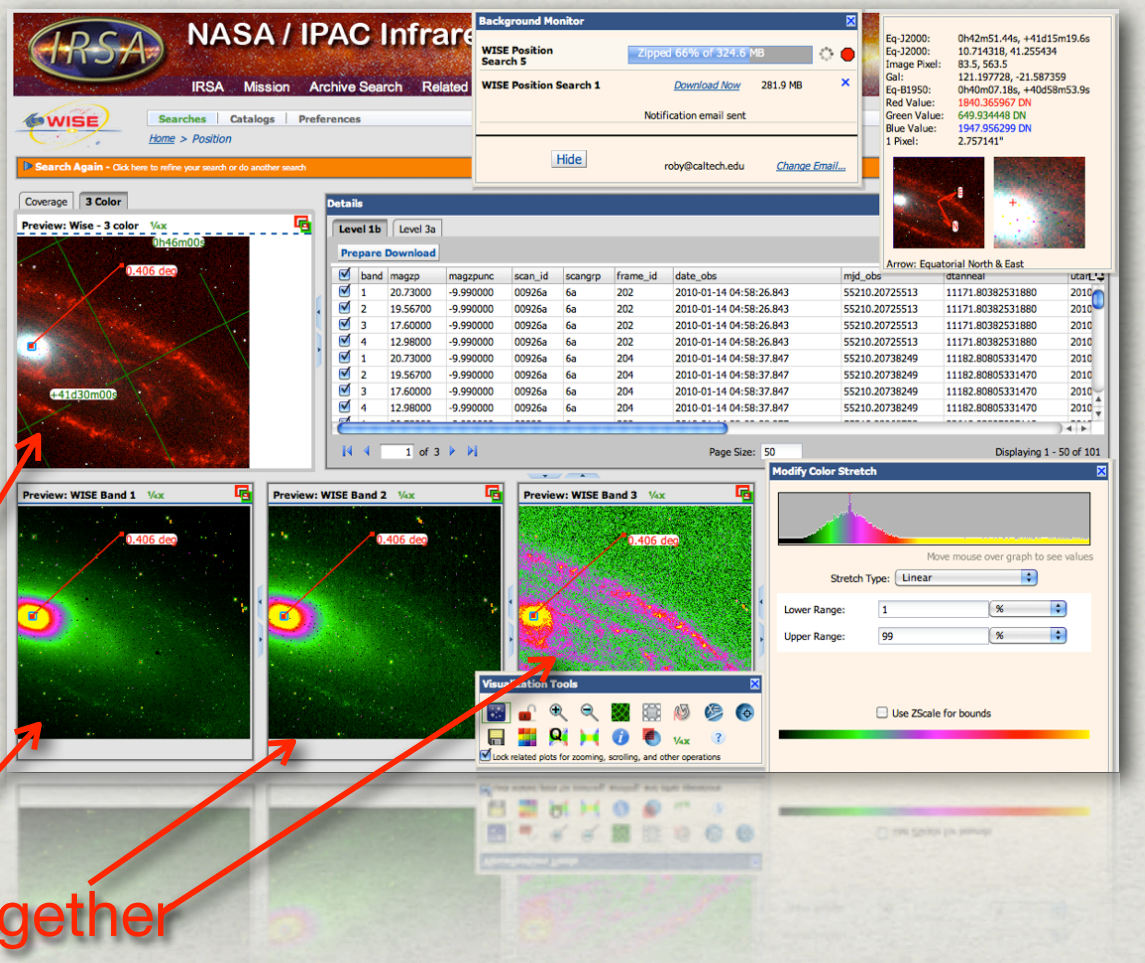
All Change



Use: WISE Image Archive

Released:

- V1: April 15, 2011

4 Images, plus 3 color

142 TB this year
260 TB next year